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Short communication

PREVALENCE OF *LISTERIA MONOCYTOGENES* IN DOGS IN ISFAHAN, IRAN

H. A. ALIDOOSTI[1], M. R. RAZZAGHI MANESH[1], S. I. MASHHADY RAFIE[2] & M. O. DADAR[3]

[1]Graduate of Faculty of Veterinary Medicine, Islamic Azad University, Shahrekord Branch, Shahrekord, Iran; [2]Department of Small Animal Internal Medicine, Faculty of Specialized Veterinary Science, Science and Research Brach, Islamic Azad University, Tehran, Iran; [3]Institute of Scientific Applied Higher Education of Jahad-e-Keshavarzi, Center of Isfahan, Iran

Summary

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Listeria monocytogenes is a Gram positive, facultative intracellular pathogen with the capacity to cause food poisoning outbreaks as well as severe illness in vulnerable human population groups. In this paper the faecal carriage rate of *Listeria monocytogenes* in domestic dogs in Isfahan city, determined from 92 faecal samples by bacteriological methods. *Listeria monocytogenes* was isolated from only one of the samples examined (1.08%). The serotype of isolated bacteria was 1/2b. It was concluded that stray dogs could be a reservoir of the organism as well as a source of human listeriosis in Iran. This is the first report on the isolation of *Listeria monocytogenes* from domestic dogs in Isfahan city.

Key words: dog, faeces, *Listeria monocytogenes*, Iran, Isfahan

Listeriosis caused by the Gram-positive, facultative intracellular bacterium *Listeria monocytogenes* is one of the leading causes of death due to foodborne illness in the industrialised world (Mehmet *et al.,* 2006). In human, listeriosis is a relatively rare but very serious disease, with an estimated hospitalization rate that exceeds 90% and a mortality rate of approximately 15–30% (Mehmet *et al.,* 2006).

L. monocytogenes strains are divided into 13 serotypes: 1/2a, 1/2b, 1/2c, 3a, 3b, 3c, 4a, 4ab, 4b, 4c, 4d, 4e and 7 (Seeliger & Höhne, 1979). *L. monocytogenes* causes infections characterised by meningoencephalitis, septicaemia and abortion in animals and humans and is distributed in the environment (soil, sewage, and silage). It can also be isolated from the faeces of healthy animals and humans (Seeliger & Jones, 1986). Transmission of *Listeria* from animals to humans with direct contact is a possible but rare route (McLauchlin & Low, 1994; Greene &

Prescott, 2012). Infected fleas could transmit *L. monocytogenes* (Dobler & Pfeffer, 2011). Listeriosis is a foodborne infection (Liu, 2006; Gandhi & Chikindas, 2007; Renier *et al.,* 2011) so contaminated foods are the main source of the pathogen (Farber & Peterkin, 1991; Schönberg *et al.,* 1996; Sireli *et al.,* 2008).

Clinical listeriosis is relatively rare in most monogastric mammals such as dogs, cats, horses and pigs, but appears more commonly in rodents and lagomorpha, where listeriosis was first described (Murray *et al.,* 1926; Gray & Killinger, 1966; Low & Linklater, 1985; Low & Donachie, 1997; Gyles *et al.,* 2010). Notably, *L. monocytogenes* has also been isolated from clinically healthy monogastric mammals (Ryser & Marth, 2007). In monogastric animals listeriosis is rare and primarily manifests itself as septicaemia (Low & Linklater, 1985; Schroeder & Van Rensburg, 1993; Low & Donachie, 1997; Ryser & Marth, 2007). The agent has also been detected in the intestinal contents of dogs in several parts of the world, with a prevalence of 0.7%–3% (Iida *et al.,* 1998; Yoshida *et al.,* 2000) and thus presents a health risk for humans where humans and dogs are in close contact. Abortion, meningoencephalitis and other manifestations such as conjunctivitis are also possible, but their relative frequency differs by animal species and the main clinical manifestations of ruminant listeriosis are encephalitis, septicaemia and abortion (Low & Linklater, 1985; Low & Donachie, 1997; Evans *et al.,* 2004; Ryser & Marth, 2007).

This study was carried out to investigate the possible presence and the carriage rate of *Listeria monocytogenes* in the intestinal contents of domestic dogs.

Rectal swabs from 92 domestic dogs brought to the clinics in the Isfahan province were collected aseptically from January to May 2012 in Carry-Blair Transport Medium (Oxoid CM519) and transported on ice to the laboratory. Fifty nine (64.1%) of the dogs were apparently healthy and the others (35%) were diarrhoeic at the time of sampling. The dogs were crossbred between 1 month and 5 years of age. Of them, 49% were males and 47 (51%) – females.

The samples were transferred into 0.1% peptone water and faecal suspensions were prepared by shaking. Then 0.1 mL of each faecal suspension was added to 9 mL of Listeria Enrichment Broth (Listeria Enrichment Broth Base-Oxoid CM862 plus Listeria Selective Enrichment Supplement-Oxoid SR141) and incubated at 30 ºC for up to 7 days. After 24 h, 48 h, and 7 days, 0.1 mL of each selective enrichment broth was inoculated onto Listeria Selective Medium (Listeria Selective Agar Base-Oxoid CM856 plus Listeria Selective Enrichment Supplement-Oxoid SR141) plates and incubated at 35 ºC for up to 48 h. Typical colonies of *Listeria* were picked off the positive plate after incubation and characterised using standard procedures (Seeliger & Jones 1986; Quinn *et al.,* 2000). The isolate was also identified by BD Phoenix Automated Microbiology System (BD Diagnostic Systems, Sparks, MD, USA). Stereotyping was on the basis of somatic and flagella antigens using *Listeria* O and H antisera (Denka Seiken 214362, Tokyo, Japan).

Listeria monocytogenes was isolated from only 1 (1.08%) of 92 canine faecal samples. The dog from which the pathogen was isolated was a 4-year-old female cross-breed, with diarrhoea at the time of sampling. Based on somatic (O) and flagella (H) antigens, *L. monocytogenes* strains are divided into 13 serotypes: 1/2a, 1/2b, 1/2c, 3a, 3b, 3c, 4a, 4ab, 4b, 4c, 4d,

4e and 7 (Seeliger & Höhne, 1979). The detected isolate was stereotyped as 1/2b.

The faecal carriage rate of *L. monocytogenes* in dogs has not been investigated in most countries, including Iran. In our study, the faecal carriage rate was 1.08% in all dogs examined. This rate is similar to those mentioned above. The detected serotype is one of the 3 *L. monocytogenes* serotypes (1/2a, 1/2b, 4b). This is the most common cause of human listeriosis (Low & Donachie 1997; Iida *et al.,* 1998; Sireli *et al.,* 2008). Therefore dogs might act as a reservoir of *L. monocytogenes* and even be a source for listeriosis in humans in Isfahan city, Iran.

Clinical listeriosis is relatively rare in most monogastric mammals such as dogs, cats, horses and pigs, but *L. monocytogenes* has also been isolated from clinically healthy monogastric mammals (Ryser & Marth, 2007).

Serotyping has been a classical tool in subtyping of *Listeria monocytogenes*. From the 13 known *L. monocytogenes* serotypes – 1/2a, 1/2b, 1/2c, 3a, 3b, 3c, 4a, 4ab, 4b, 4c, 4d, 4e and 7 (Seeliger & Höhne, 1979) and 3 serotypes (1/2a, 1/2b, and 4b) cause the vast majority of clinical cases (Tappero *et al.,* 1995). In our study serotype 1/2b was isolated and this serotype together with serotype 4b have been found to be the major serotypes, causing 30% mortality after the consumption of contaminated ready-to-eat foods, which include raw meat (Farber & Peterkin, 1991; Schönberg *et al.,* 1996; Sireli *et al.,* 2008). Serovar 4b strains are responsible for 33 to 50% of sporadic human cases, while bacteria recovered from food mostly belong to serogroup 1/2 (Rocourt & Cossart, 1997). In Finland, the isolation rate of *Listeria monocytogenes* from the intestinal contents of dogs was reported as 0.7% (Husu & Asikainen, 1992). Similarly to our results, in Germany *L. monocytogenes* was isolated from 4 (1.3%) of 300 faecal samples from dogs and the isolates were classified into serotypes 1/2b (3 strains) and 4ab (1 strain) (Weber *et al.,* 1995). Several serotypes of the pathogen were isolated in Japan by Iida et al. (Iida *et al.,* 1991; 1998). The prevalence of *Listeria monocytogenes* in the intestinal contents of healthy dogs was reported to be 0.9% (5/540) and the serotypes identified were 1/2c (1 strain), 4b (2 strains), and 4 (2 strains).Yoshida *et al.* (2000) investigated the incidence of the bacteria in raccoon dogs in Japan. Of the 104 raccoon dogs examined, only 1 (0.96%) was positive for the presence of *Listeria monocytogenes* and the serotype was identified as 4c. In epidemiological studies examining the prevalence of Listeria monocytogenes in domestic and wild animals, fecal carriage rates were 0.8% in pigs, 6.5% in rats (Iida *et al.,* 1998), 1.25% in monkeys, and 0.79% in martens (Yoshida *et al.* 2000).

Ruža *et al.* (2000) provided the first description of listeriosis among chinchillas in the County of Međimurje in Croatia. In sera analysis of 3 horses, 1 dog, and 6 herdsmen for the presence of antibodies against *L. monocytogenes* by the Osebold agglutination assay on a commercial farm in Akyurt, Ankara, all horses, the dog and 5 herdsmen were seropositive (Mehmet *et al.,* 2006).

In conclusion, our study showed that *Listeria monocytogenes* was isolated from only 1 (1.08%) of 92 faecal samples from home-owned dogs in the Isfahan province, Iran. The serotype of the canine isolated was the same as those reported in other European isolates.

Serotypes 1/2a, 1/2b and 4b cause the majority of clinical cases (Tappero *et al.,* 1995) and in other reports 1/2b and 4b

serotypes were reported to cause mortality in humans (Farber & Peterkin, 1991; Schönberg *et al.,* 1996; Sireli *et al.,* 2008). Thus, the isolated serotype in our study (1/2b) is a zoonotic pathogen and has hygienic importance.

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Correspondence:

H. A. Alidoosti,
Graduate of the Faculty of Veterinary Medicine,
Islamic Azad University,
Shahrekord Branch,
Shahrekord, Iran